Product Information

SAMSUNG

ELECTRONICS

LEAD-FREE

DATE   :   March 29, 2012.

SAMSUNG TFT-LCD
MODEL NO : LTN156AT27-H02

NOTE : Extension code [-H02]
            → LTN156AT27-H
        Surface type [**Glare**]

The information described in this SPEC can not be changed without SEC's permission.
The information described in this SPEC is preliminary and can be changed without prior notice

Application Engineer Group

SAMSUNG ELECTRONICS CO., LTD.

Samsung Secret

Doc.No.	LTN156AT27-H02	Rev.No	04-PI-G-120329	Page	1 / 24

Product Information

CONTENTS

Samsung Secret

Doc.No.	LTN156AT27-H02	Rev.No	04-PI-G-120329	Page	2 / 24

Product Information

GENERAL DESCRIPTION

DESCRIPTION

LTN156AT27-H02 is a color active matrix TFT (Thin Film Transistor) liquid crystal display (LCD) that uses amorphous silicon TFT as switching devices. This model is composed of a TFT LCD panel, a driver circuit and a backlight system. The resolution of a 15.6" contains 1366 x 768 pixels and can display up to 262,144 colors. 6 O'clock direction is the Optimum viewing angle.

FEATURES

- High contrast ratio
- HD (1366 x 768 pixels) resolution
- Low power consumption
- Fast response time
- LED Back Light with embedded LED Driver
- DE (Data enable) only mode
- 3.3V LVDS Interface
- Onboard EEDID chip
- Green product (RoHS compliant)

APPLICATIONS

- Notebook PC
- If the usage of this product is not for PC application, but for others, please contact SEC

GENERAL INFORMATION

Item	Specification	Unit	Note
Display area	344.232 (H) x 193.536 (V) (15.6"diagonal)	mm	
Driver element	a-Si TFT active matrix		
Display colors	262,144		
Number of pixel	1366 x 768	pixel	16 : 9
Pixel arrangement	RGB vertical stripe		
Pixel pitch	0.252 (H) x 0.252 (V) (TYP.)	mm	
Display Mode	Normally white		
Surface treatment	Haze 0, Hardness 3H		Glare

Samsung Secret

Doc.No.	LTN156AT27-H02	Rev.No	04-PI-G-120329	Page	3 / 24

Product Information

Mechanical Information

Item		Min.	Typ.	Max.	Unit	Note
Module size	Horizontal (H)	358.8	359.3	359.8	mm	
	Vertical (V)	209.0	209.5	210.0	mm	Module ~ Module
	Depth (D)	-	-	5.5	mm	(1)
Weight		-	-	450	g	

Note (1) Measurement condition of outline dimension
. Equipment : Vernier Calipers
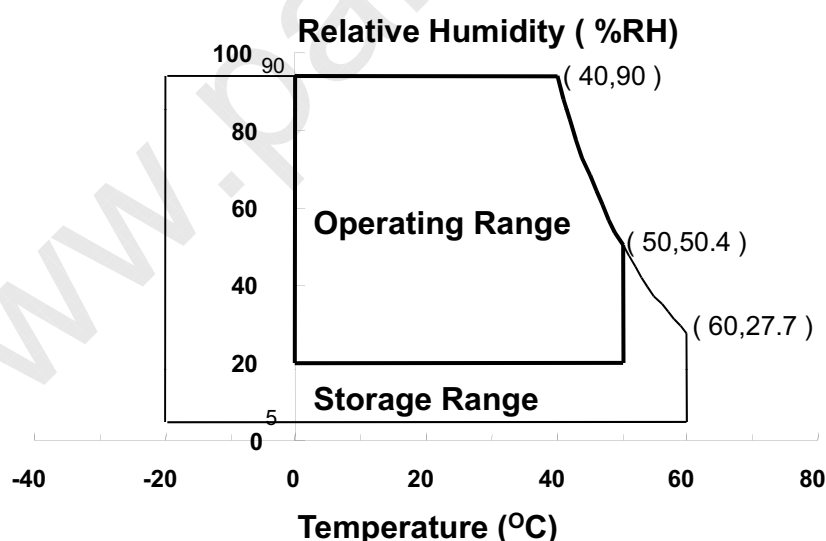. Push Force : 750g ·f (minimum)

1. ABSOLUTE MAXIMUM RATINGS

1.1 ENVIRONMENTAL ABSOLUTE RATINGS

Item	Symbol	Min.	Max.	Unit	Note
Storage temperate	TSTG	-20	60	°C	(1)
Operating temperate (Temperature of glass surface)	TOPR	0	50	°C	(1)
Shock (non-operating)	Snop	-	240	G	(2),(4)
Vibration (non-operating)	Vnop	-	2.41	G	(3),(4)

Note (1) Temperature and relative humidity range are shown in the figure below.
90 % RH Max. (40 °C $\geq$ Ta)
Maximum wet - bulb temperature at 39 °C or less. (Ta $>$ 40 °C) No condensation

Relative Humidity (%RH)

Operating Range

(40,90)

(50,50.4)

(60,27.7)

Storage Range

Temperature (°C)

-40   -20   0   20   40   60   80

(2) 2ms, half sine wave, one time for ±X, ±Y, ± Z.
(3) 5 - 500 Hz, random vibration, 30min for X, Y, Z.
(4) At testing Vibration and Shock, the fixture in holding the Module to be tested have to be hard and rigid enough so that the Module would not be twisted or bent by the fixture.

Samsung Secret

Doc.No.	LTN156AT27-H02	Rev.No	04-PI-G-120329	Page	4 / 24

Product Information

1.2 ELECTRICAL ABSOLUTE RATINGS

(1) TFT LCD MODULE

V_{DD} =3.3V, V_{SS} = GND = 0V

Item	Symbol	Min.	Max.	Unit	Note
Power Supply Voltage	V_{DD}	$V_{DD} - 0.3$	$V_{DD} + 0.3$	V	(1)
Logic Input Voltage	V_{DD}	$V_{DD} - 0.3$	$V_{DD} + 0.3$	V	(1)

Note (1) Within Ta (25 $\pm$ 2 °C)

Samsung Secret

Doc.No.	LTN156AT27-H02	Rev.No	04-PI-G-120329	Page	5 / 24

Product Information

2. OPTICAL CHARACTERISTICS

The following items are measured under stable conditions. The optical characteristics should be measured in a dark room or equivalent state with the methods shown in Note (5). Measuring equipment : TOPCON SR-3

* Ta = 25 $\pm$ 2 °C, V_{DD}=3.3V,   fv= 60Hz, f_{DCLK} =76.3 MHz, I_L = 25mA

Item		Symbol	Condition	Min.	Typ.	Max	Unit	Note
Average Luminance of White (5 Points)		$Y_{L,AVE}$		170	200	-	cd/m²	I_L= 25mA (1), (4)
Color Chromaticity (CIE)	Red	R_X	Normal Viewing Angle ϕ = 0 θ = 0	TYP -0.03	0.615	TYP +0.03	-	(1), (5) SR-3
		R_Y			0.340			
	Green	G_X			0.330			
		G_Y			0.560			
	Blue	B_X			0.160			
		B_Y			0.135			
	White	W_X			0.313			
		W_Y			0.329			
Viewing Angle	Hor.	θ_L	CR $\geq$ 10 At center	30	45	-	Degrees	(1), (5) SR-3
		θ_R		30	45	-		
	Ver.	ϕ_H		10	15	-		
		ϕ_L		20	35	-		
13 Points White Variation		δ_L		-	-	1.6	-	(6)

Samsung Secret

Product Information

Note 1) Definition of Viewing Angle : Viewing angle range(10 ≤ C/R)

Normal Line
$\phi = 0^o, \theta = 0^o$

θ

6 O'clock
direction
$\phi_L = 90^o$
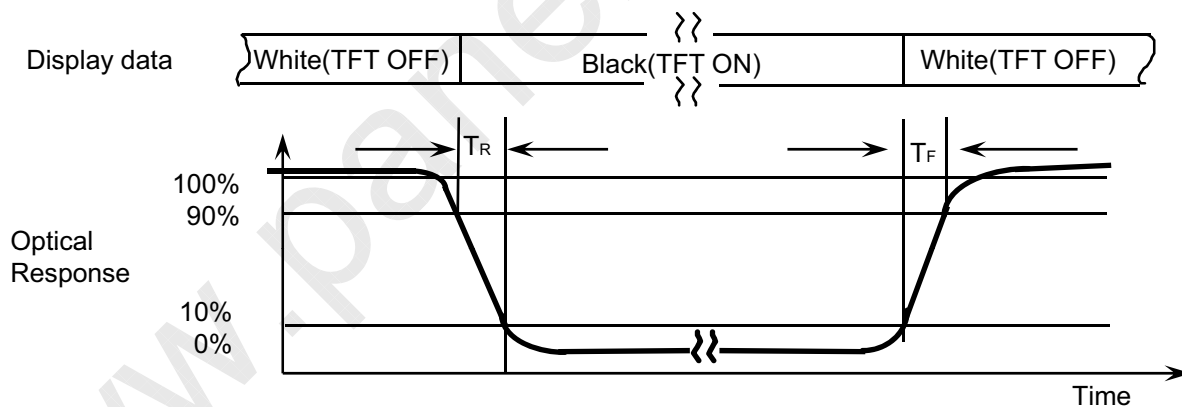
y'

x'

$\theta_R = 90^o$
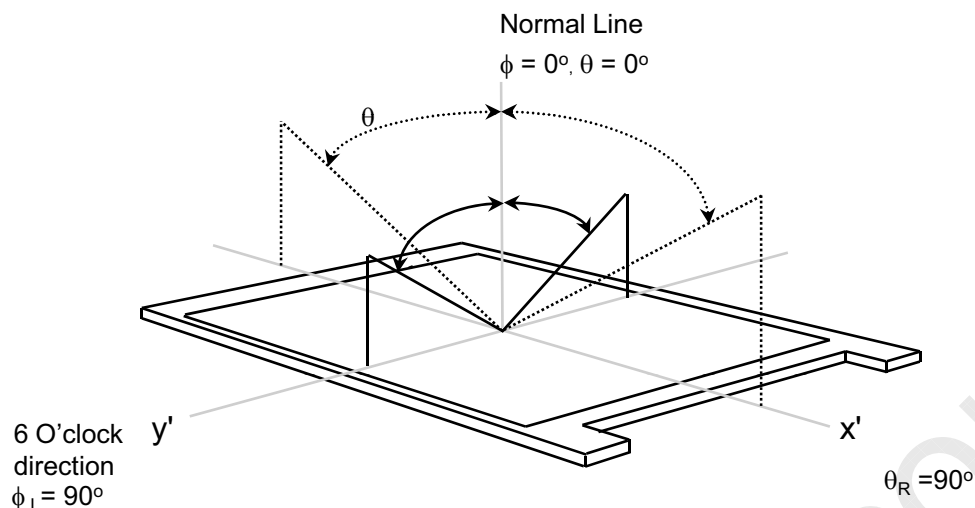
Note 2) Definition of Contrast Ratio (CR) : Ratio of gray max (Gmax) ,gray min (Gmin)
at 5 points (33, 55, 77, 37, 73)

$$CR = \frac{CR(33) + CR(55) + CR(77) + CR(37) + CR(73)}{5}$$

Points : 33, 55, 77, 37, 73 at the figure of Note (6).

Note 3) Definition of Response time :

Display data | White(TFT OFF) | Black(TFT ON) | White(TFT OFF)

Optical Response

100%
90%

T_R

T_F

10%
0%

Time

Note 4) Definition of Average Luminance of White : measure the luminance of white at 5 points.

(30%) (50%) (70%)

VIEW AREA

Average Luminance of White ($Y_{L,AVE}$)

$$Y_{L,AVE} = \frac{Y_{L33} + Y_{L55} + Y_{L77} + Y_{L37} + Y_{L73}}{5}$$

33   37   (30%)
      55   (50%)
73   77   (70%)

◯ : test point
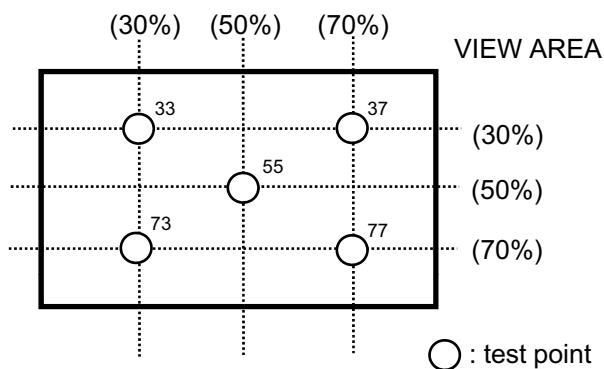
Samsung Secret

| Doc.No. | LTN156AT27-H02 | Rev.No | 04-PI-G-120329 | Page | 7 / 24 |

Note 5) After stabilizing and leaving the panel alone at a given temperature for 30 min , the measurement
should be executed. Measurement should be executed in a stable, windless, and dark room.
30 min after lighting the backlight. This should be measured in the center of screen.
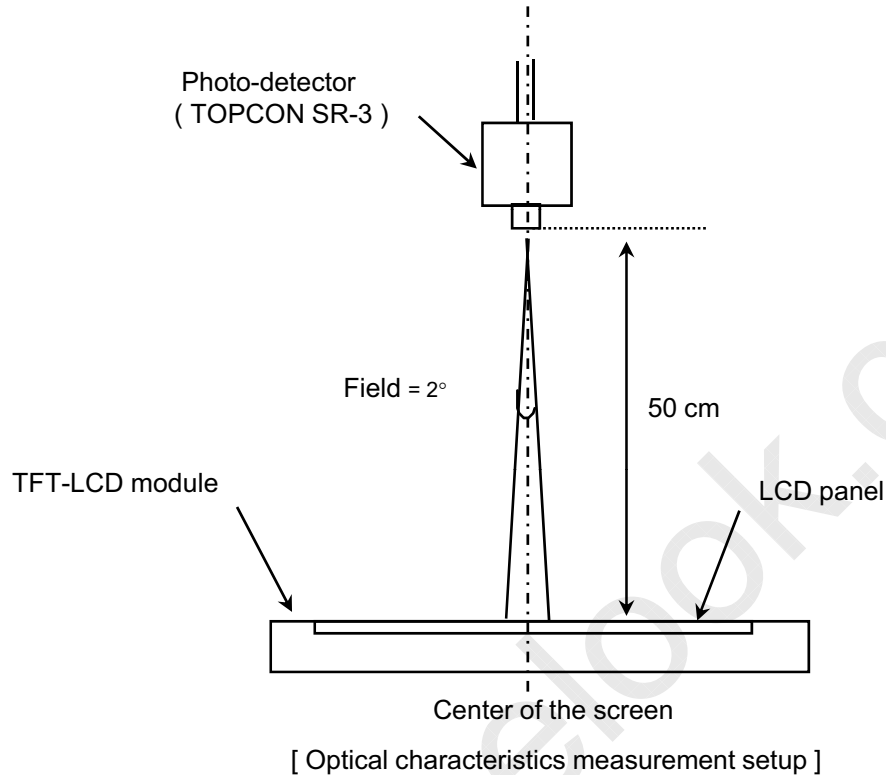LED current : 25.0mA
Environment condition : Ta = 25 ± 2 °C

Photo-detector
(TOPCON SR-3)

Field = 2°

50 cm

TFT-LCD module

LCD panel

Center of the screen

[Optical characteristics measurement setup]

Note 6) Definition of 13 points white variation (δ L), [① ~ ⑬]

$$\delta_L = \frac{\text{Maximum luminance of 13 points}}{\text{Minimum luminance of 13 points}}$$

10mm   10mm

10mm   25%   50%   75%

10mm

13   12   11

10   9   25%

8   7   6   50%   ◯   : test point

5   4   75%

3   2   1

10mm
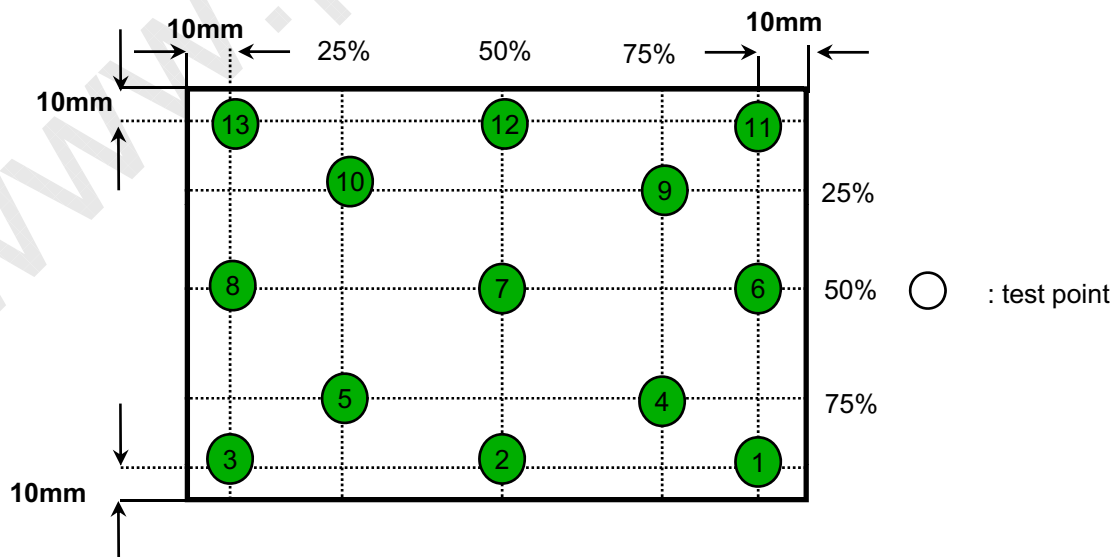
Samsung Secret

Doc.No.	LTN156AT27-H02	Rev.No	04-PI-G-120329	Page	8 / 24

3. ELECTRICAL CHARACTERISTICS

3.1 TFT LCD MODULE

Ta= $25 \pm 2°C$

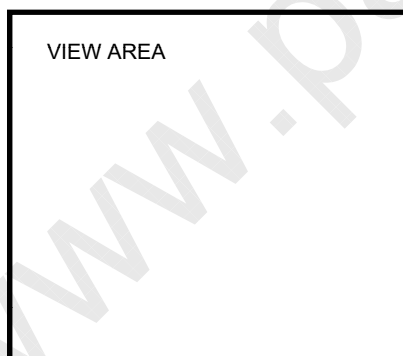| Item		Symbol	Min.	Typ.	Max.	Unit	Note
Voltage of Power Supply		Vcc	3.0	3.3	3.6	V	
Differential Input Voltage for LVDS Receiver Threshold	High	V_{IH}	-	-	+100	mV	V_{CM} = +1.2V
	Low	V_{IL}	-100	-	-	mV	
Vsync Frequency		f_V	-	60	-	Hz	
Hsync Frequency		f_H	-	47.5	-	KHz	
Main Frequency		f_{DCLK}		76.3		MHz	
Rush Current		I_{RUSH}	-	-	1.5	A	(4)
Current of Power Supply	White	I_{DD}	-	240	-	mA	(2),(3)*a
	Mosaic		-	240	264	mA	(2),(3)*b

Note (1) Display data pins and timing signal pins should be connected.(GND = 0V)

   (2) f_V = 60Hz, f_{DCLK} = 76.3MHZ, V_{DD} = 3.3V , DC Current.

   (3) Power dissipation pattern

*a) White Pattern   *b) Mosaic Pattern

VIEW AREA

Display Brightest Gray Level

Display Darkest Gray Level
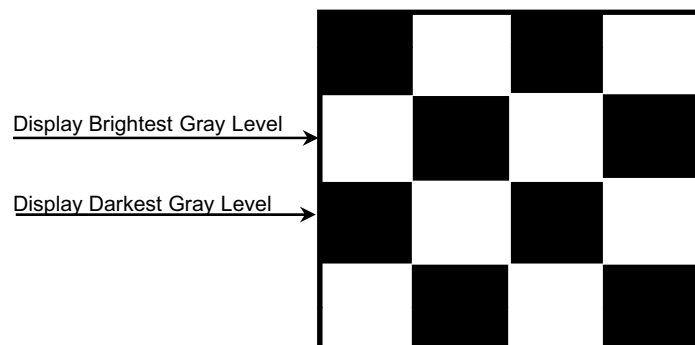
Doc.No.	LTN156AT27-H02	Rev.No	04-PI-G-120329	Page	9 / 24

Product Information

4) Rush current measurement condition
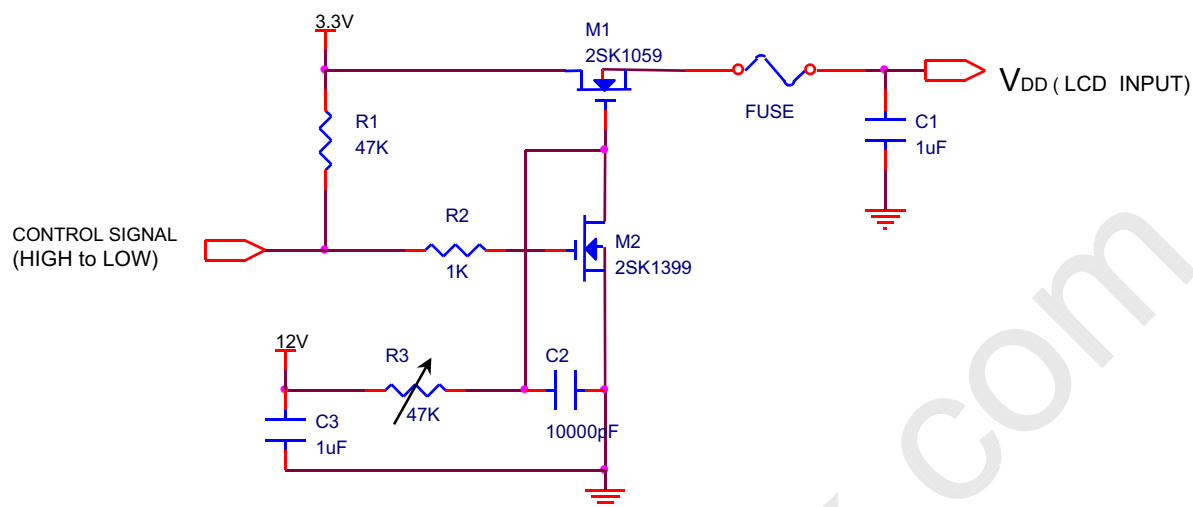
V_{DD} rising time is 470us

Doc.No.	LTN156AT27-H02	Rev.No	04-PI-G-120329	Page	10 / 24

Product Information

3.2 BACK-LIGHT UNIT

Ta= 25 ± 2 ℃

Item	Symbol	Min.	Typ.	Max.	Unit	Note
LED Forward Current	IF	-	27	-	mA	
LED Forward Voltage	VF	-	3.2	3.4	V	
LED Array Voltage	VP	-	28.8	-	V	VF X 9 LEDs
Power Consumption	P	-	3.7	4	W	IF X VF X 36 LEDs
Operating Life Time	Hr	12,000	-	-	Hour	(1)

Note (1) Life time (Hr) of LEDs can be defined as the time in which it continues to operate under the
condition Ta= 25 ± 2 ℃ and IF = 25 mArms until one of the following event occurs.
   1. When the brightness becomes 50% or lower than the original.

3.3 LED Driver

- On board LED Driver (Manufacturer : Richtek)

Ta= 25 ± 2 ℃

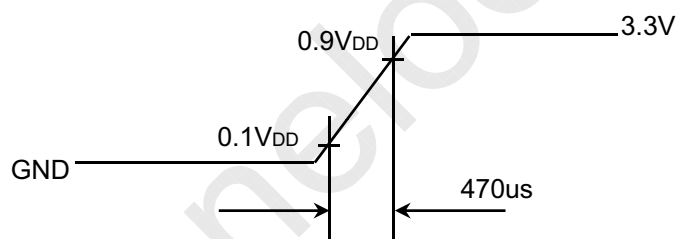| Item	Symbol	Min.	Typ.	Max.	Unit	Note
Input Voltage	Vin	6	12	20	V	
PWM Duty	D	10	-	100	%	PWM frequency (1~10khz)
PWM Frequency	Fpwm	0.12		20	KHz	

Samsung Secret

Doc.No.	LTN156AT27-H02	Rev.No	04-PI-G-120329	Page	11 / 24

4. BLOCK DIAGRAM

4.1 TFT LCD Module
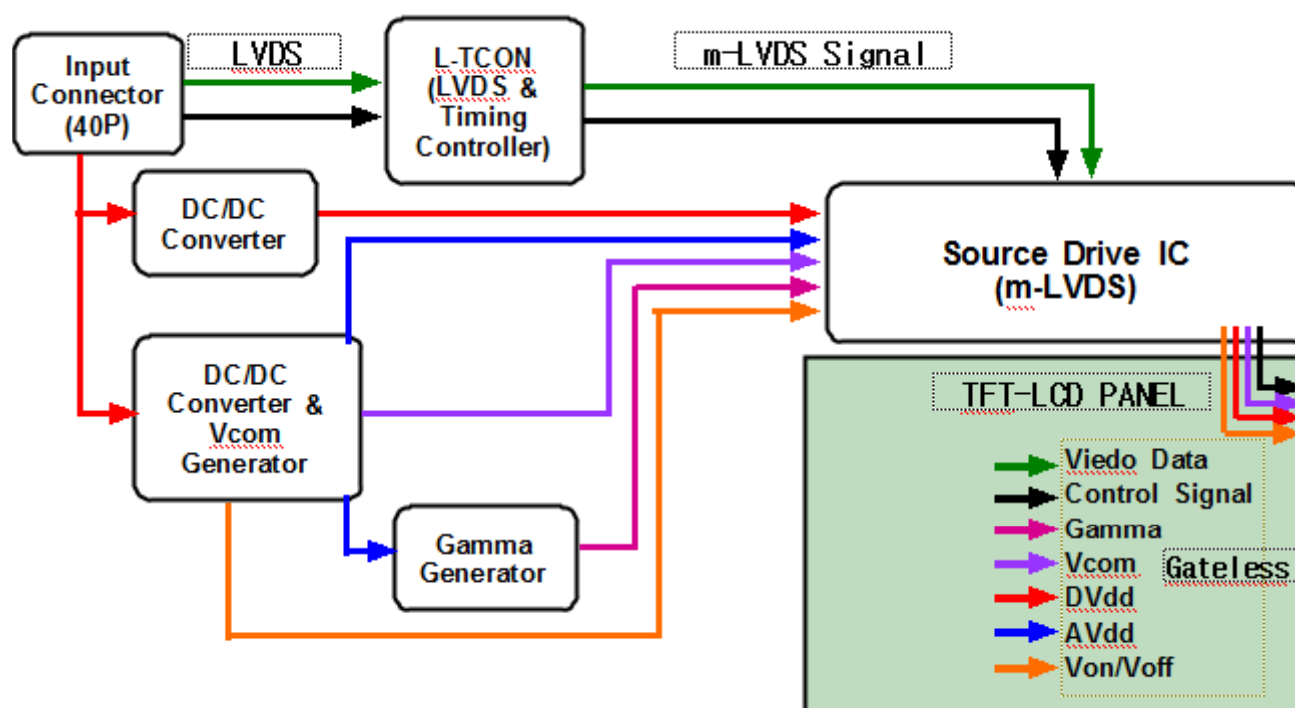
Doc.No.	LTN156AT27-H02	Rev.No	04-PI-G-120329	Page	12 / 24

Product Information

5. INPUT TERMINAL PIN ASSIGNMENT

5.1. Input Signal & Power (LVDS, Connector : I-PEX 20455-040E-12)

No.	Signal	Full Description
1	NU	NOT USED
2	VDD	Power (Vdd = 3.3V)
3	VDD	Power (Vdd = 3.3V)
4	VCC EDID	VCC_EDID
5	WPN	WPN
6	SCL	DATA FOR CLOCK
7	SDA	DATA FOR EDID
8	O_RXIN0-	LVDS Oth Signal Negative(Odd)
9	O_RXIN0+	LVDS Oth Signal Positive(Odd)
10	GND	Ground
11	O_RXIN1-	LVDS 1st Signal Negative(Odd)
12	O_RXIN1+	LVDS 1st Signal Positive(Odd)
13	GND	Ground
14	O_RXIN2-	LVDS 2nd Signal Negative(Odd)
15	O_RXIN2+	LVDS 2nd Signal Positive(Odd)
16	GND	Ground
17	O_RXCLKIN-	LVDS Clock Signal Negative(Odd)
18	O_RXCLKIN+	LVDS Clock Signal Positive(Odd)
19	GND	Ground
20	NC	NOT CONNECT
21	NC	NOT CONNECT
22	GND	Ground
23	NC	NOT CONNECT
24	NC	NOT CONNECT
25	GND	Ground
26	NC	NOT CONNECT
27	NC	NOT CONNECT
28	GND	Ground
29	NC	NOT CONNECT
30	NC	NOT CONNECT
31	GND	Ground
32	GND	Ground
33	GND	Ground
34	NU	NOT USED
35	PWM	PWM
36	BLEN	BL ENABLE
37	NC	NOT CONNECT
38	VBL	B/L VCC
39	VBL	B/L VCC
40	VBL	B/L VCC

Samsung Secret

Doc.No.	LTN156AT27-H02	Rev.No	04-PI-G-120329	Page	13 / 24

5.2 LVDS Interface : Transmitter DS90CF363 or Compatible

Pin No.	Name	RGB Signal	Pin No.	Name	RGB Signal
51	TxIN0	R0	14	TxIN14	G5
52	TxIN1	R1	15	TxIN15	B0
54	TxIN2	R2	19	TxIN18	B1
55	TxIN3	R3	20	TxIN19	B2
56	TxIN4	R4	22	TxIN20	B3
3	TxIN6	R5	23	TxIN21	B4
4	TxIN7	G0	24	TxIN22	B5
6	TxIN8	G1	27	TxIN24	Hsync
7	TxIN9	G2	28	TxIN25	Vsync
11	TxIN12	G3	30	TxIN26	DE
12	TxIN13	G4	31	TxCLKIN	Clock

LVDS INTERFACE
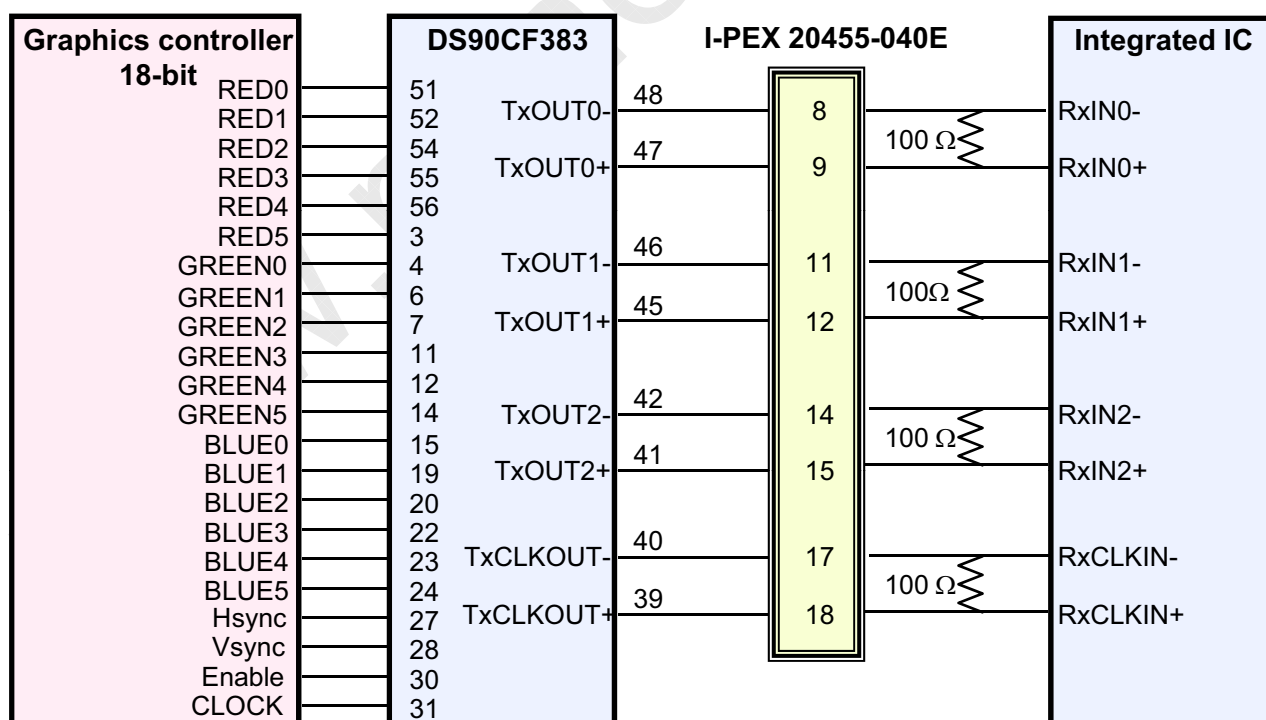
Note : The LCD Module uses a 100ohm resistor between positive and negative lines of each receiver input.

Samsung Secret

Doc.No.	LTN156AT27-H02	Rev.No	04-PI-G-120329	Page	14 / 24

5.3 Timing Diagrams of LVDS For Transmission

LVDS Receiver : Integrated T-CON

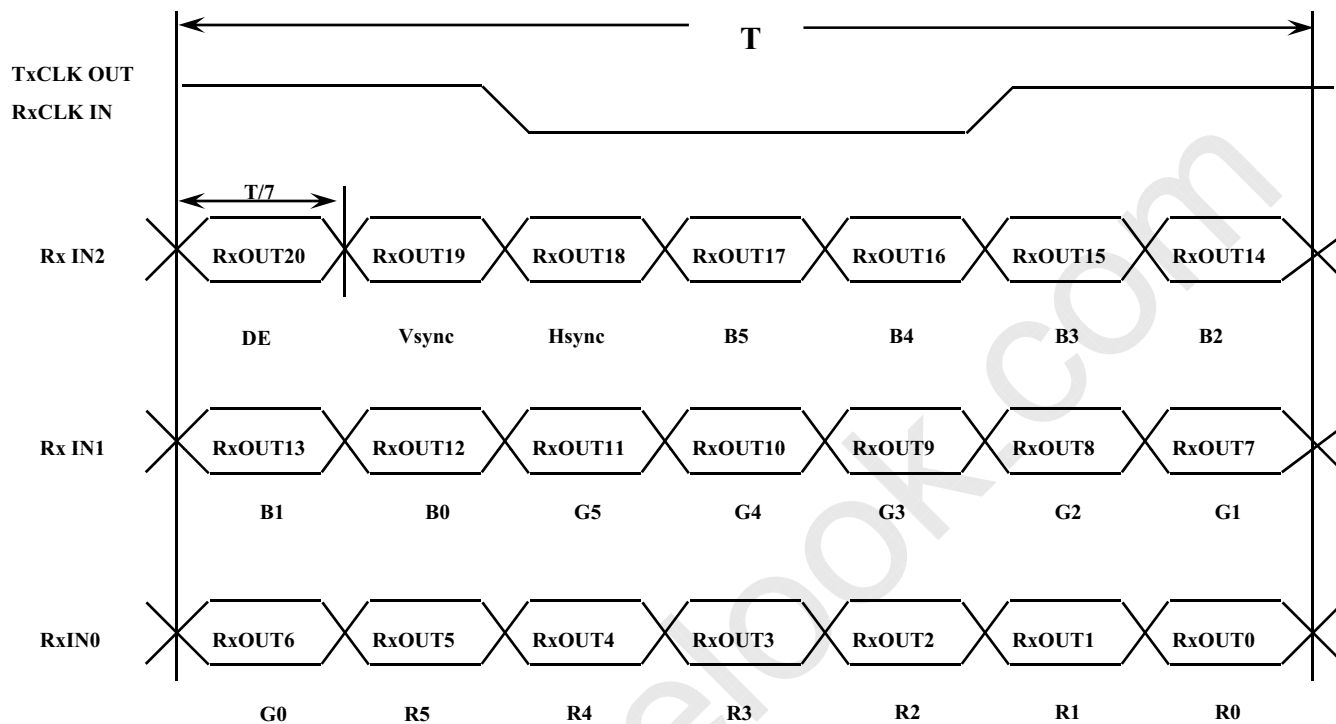| Doc.No.	LTN156AT27-H02	Rev.No	04-PI-G-120329	Page	15 / 24

Product Information

5.4 Input Signals, Basic Display Colors and Gray Scale of Each Color

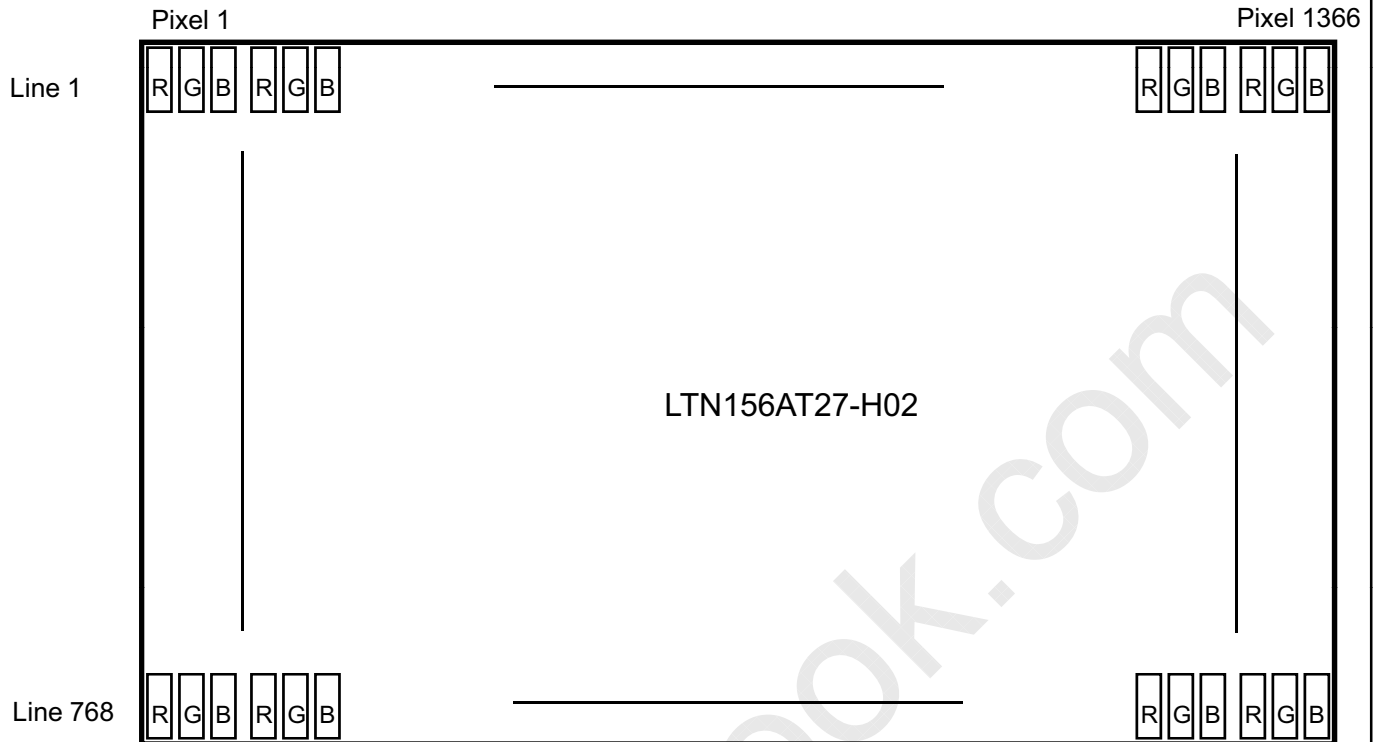| Color	Display	Data Signal																		Gray Scale Level
		Red						Green						Blue						
		R0	R1	R2	R3	R4	R5	G0	G1	G2	G3	G4	G5	B0	B1	B2	B3	45	B5	
Basic Colors	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	-
	Green	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	-
	Cyan	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	-
	Red	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	-
	Magenta	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1	-
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	-
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	-
Gray Scale Of Red	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R0
	Dark	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R1
	↑	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R2
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	R3~R60
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
	↓	1	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	R61
	Light	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	R62
	Red	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	R63
Gray Scale Of Green	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	G0
	Dark	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	G1
	↑	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	G2
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	G3~G60
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
	↓	0	0	0	0	0	0	1	0	1	1	1	1	0	0	0	0	0	0	G61
	Light	0	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	G62
	Green	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	G63
Gray Scale Of Blue	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	B0
	Dark	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	B1
	↑	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	B2
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	B3~B60
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
	↓	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1	B61
	Light	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	B62
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	B63

Note 1) Definition of gray :
    Rn: Red gray, Gn: Green gray, Bn: Blue gray (n=gray level)
Note 2)Input signal: 0 =Low level voltage, 1=High level voltage

Samsung Secret

Doc.No.	LTN156AT27-H02	Rev.No	04-PI-G-120329	Page	16 / 24

5.5 Pixel Format in the display

Pixel 1   Pixel 1366

Line 1   R G B R G B   R G B R G B

LTN156AT27-H02

Line 768   R G B R G B   R G B R G B

Doc.No.	LTN156AT27-H02	**Rev.No**	04-PI-G-120329	**Page**	17 / 24

Product Information

6. INTERFACE TIMING

6.1 Timing Parameters

Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
Frame Frequency	Cycle	TV	784	792	799	Lines	-
Vertical Active Display Term	Display Period	TVD	-	768	-	Lines	-
One Line Scanning Time	Cycle	TH	1589	1606	1622	Clocks	–
Horizontal Active Display Term	Display Period	THD	-	1366	-	pixels	-

6.2 Timing diagrams of interface signal

T_V

T_{VD}

DE

T_H

DCLK

T_C

DE

T_{HD}

DATA SIGNALS   Valid display data (1366 clocks)

Samsung Secret

Doc.No.	LTN156AT27-H02	Rev.No	04-PI-G-120329	Page	18 / 24
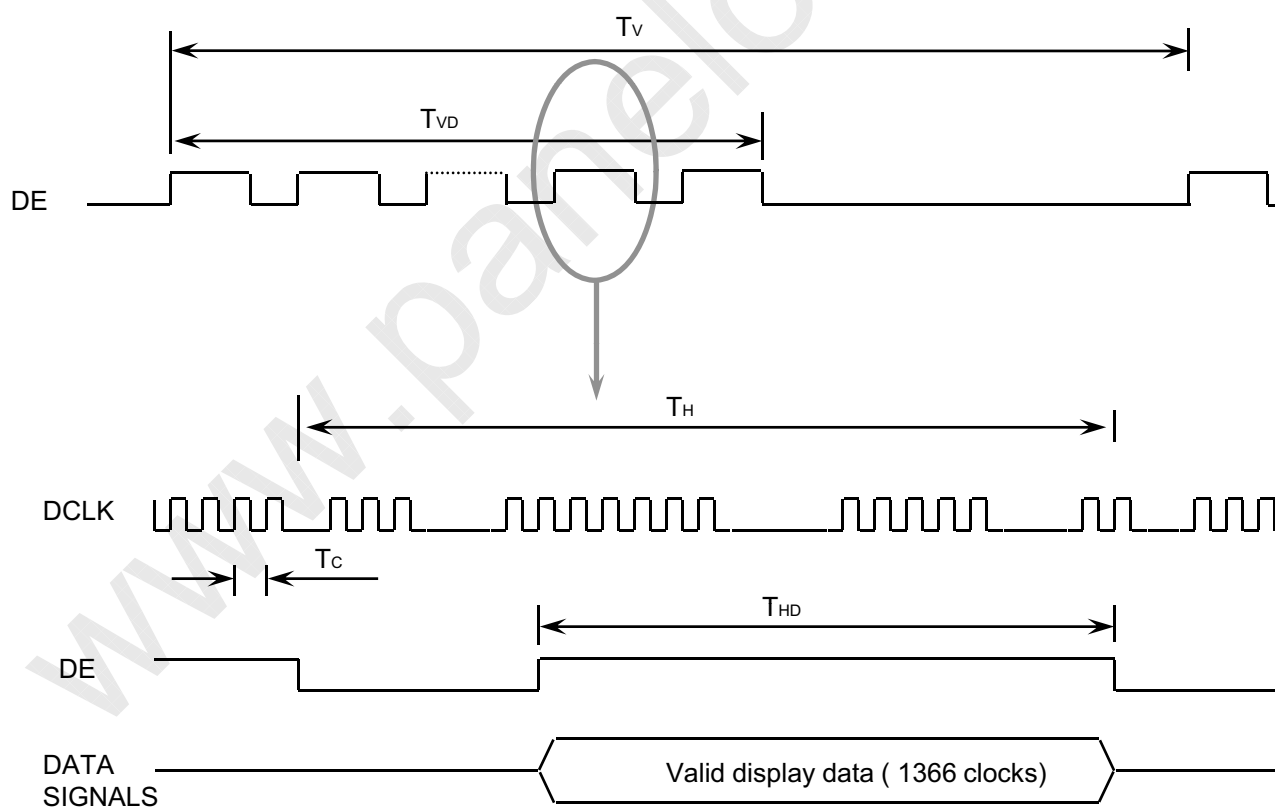
6.3 Power ON/OFF Sequence

: To prevent a latch-up or DC operation of the LCD module, the power on/off sequence should be as the diagram below.

Power ON/OFF Sequence
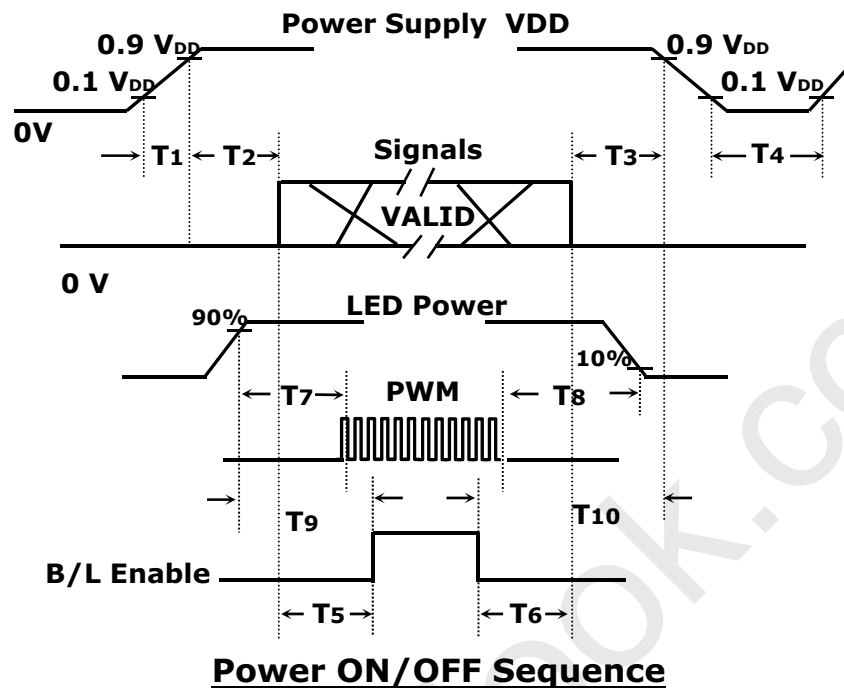
Timing (ms)	Remarks
$0.5 < T_1 \leq 10$	V_{DD} rising time from 10% to 90%
$0 < T_2 \leq 50$	Delay from V_{DD} to valid data at power ON
$0 < T_3$	Delay from valid data OFF to V_{DD} off at power OFF
$150 \leq T_4$	V_{DD} OFF time for Windows restart
$200 \leq T_5$	Delay from valid data to B/L enable at power ON
$200 \leq T_6$	Delay from valid data off to B/L disable at power OFF
$0 < T_7$	Delay from LED driver power ON to PWM ON
$0 < T_8$	Delay from PWM OFF to LED driver power OFF
$0 < T_9$	Delay from VBL on to B/L Enable ON
$0 < T_{10}$	Delay from B/L Enable Off to VBL OFF

NOTE.
- (1) The supply voltage of the external system for the module input should be the same as the definition of V_{DD}.
- (2) In case of VDD = off level, please keep the level of input signals on the low or keep a high impedance.
- (3) T4 should be measured after the module has been fully discharged between power off and on period.
- (4) Interface signal shall not be kept at high impedance when the power is on.

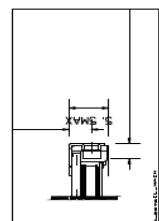| Doc.No.	LTN156AT27-H02	Rev.No	04-PI-G-120329	Page	19 / 24

Product Information

7. Mechanical Outline Dimension

Refer to the next page

Samsung Secret

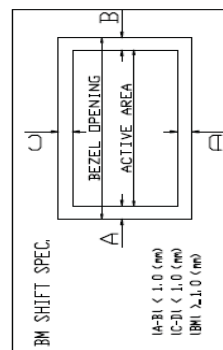| Doc.No.	LTN156AT27-H02	Rev.No	04-PI-G-120329	Page	20 / 24

NOTE
1. SIGNAL INTERFACE CONNECTOR TO BE SPECIFIED AS BELOW.
   -. MAKER : I-PEX(Not accept compatible connector basical)y
   -. INPUT CONNECTOR : I-PEX 20455-040E-12
2. LED CONNECTOR FOR BACKLIGHT TO BE SPECIFIED AS BELOW.
   -. MAKER : UJU Electronics
   -. PART NO : 51441-1041
3. CALIPERS MEASURING FORCE : 750 ± 250 gf·cm
4. MAXIMUM SCREW TORQUE : MAX 2.5 Kgf·cm
5. WEIGHT : 450 g MAX
6. IN ORDER TO AVOID IC DAMAGE, IT IS NOT ALLOW
   THAT OVERLAPPING OF CABLES OR ANTENNAS, CAMERA, WLAN,
   WWAN, OVER THESE COF LOCATIONS.

I-PEX 20455-040W-#

0.252

114.9119?±1.0000

114.912±1.0000

128±1.0000

(64.406)

BM SHIFT SPEC.

BEZEL OPENING
ACTIVE AREA

|A-B| < 1.0 (mm)
|C-D| < 1.0 (mm)
|BM| ≥ 1.0 (mm)

<USER HOLE SCREW HOLE DEPTH>

209.540.5000[OUTLINE]
197.1C BEZEL OPENING AREA]
(2.286)[ACTIVE AREA]
(104.75)
(7.534)

(6.2)
(1.782)

(7.982)
(1.782)

ACTIVE CENTER

344.232[ACTIVE AREA]
348.8[BEZEL OPENING AREA]
359.3±0.5000 [OUTLINE]

(179.65)

(2.284)
(7.534)

85±0.3000[ACTIVE CENTER TO USER HOLE]

DP=2.5MAX SCREW PENETRATION

4-3.1±0.3000
5.5 MAX [MODULE THICKNESS]

11.9±0.3000
66.9±0.3000
118.8±0.3000
185.7±0.3000

Product Information

8. GENERAL PRECAUTIONS

1. Handling

  (a) When the module is assembled, It should be attached to the system firmly
     using every mounting holes. Be careful not to twist and bend the modules.

  (b) Refrain from strong mechanical shock and / or any force to the module. In addition to
     damage, this may cause improper operation or damage to the module.

  (c) Note that polarizers are very fragile and could be easily damaged. Do not press or scratch
     the surface harder than a HB pencil lead.

  (d) Wipe off water droplets or oil immediately. If you leave the droplets for a long time,
     Staining and discoloration may occur.

  (e) If the surface of the polarizer is dirty, clean it using some absorbent cotton or soft cloth.

  (f) The desirable cleaners are water, IPA (Isoprophyl Alcohol) or Hexane.
     Do not use Ketone type materials(ex. Acetone), Ethyl alcohol, Toluene, Ethyl acid or Methyl
     chloride. It might permanent damage to the polarizer due to chemical reaction.

  (g) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or
     mouth . In case of contact with hands, legs or clothes, it must be washed away thoroughly
     with soap.

  (h) Protect the module from static , it may cause damage to the C-MOS Gate Array IC.

  (i) Use fingerstalls with soft gloves in order to keep display clean during the incoming
     inspection and assembly process.

  (j) Do not disassemble the module.

  (k) Do not pull or fold the LED FPC.

  (l) Do not touch any component which is located on the back side.

  (m) Protection film for polarizer on the module shall be slowly peeled off just before use so
     that the electrostatic charge can be minimized.

  (n) Pins of I/F connector shall not be touched directly with bare hands.

Samsung Secret

Doc.No.	LTN156AT27-H02	Rev.No	04-PI-G-120329	Page	22 / 24

2. STORAGE

We highly recommend to comply with the criteria in the table below.

ITEM	Unit	Min.	Max.
Temperature	(℃)	5	40
Storage Humidity	(%rH)	35	75
Storage life	12 months		
Storage Condition	- The storage room should provide good ventilation and temperature control. - Products should not be placed on the floor, but on the Pallet away from a wall. - Prevent products from direct sunlight, moisture nor water; Be cautious of a build up of condensation. - Avoid other hazardous environment while storing goods. - If products delivered or kept in conditions of over the storage period of 3 months, the recommended temperature or humidity range, we recommend you leave them at a temperature of 20℃ and a humidity of 50% for 24 hours.		

(a) Do not leave the module in high temperature, and high humidity for a long time.
   It is highly recommended to store the module with temperature from 5 to 40 °C and
   relative humidity of less than 70%.

(b) Do not store the TFT-LCD module in direct sunlight.

(c) The module shall be stored in a dark place. It is prohibited to apply sunlight or fluorescent
   light during the store.
(d) Storage period is recommended not to exceed 1 year.

Samsung Secret

Doc.No.	LTN156AT27-H02	Rev.No	04-PI-G-120329	Page	23 / 24

3. OPERATION

(a) Do not connect, disconnect the module in the " Power On" condition.

(b) Power supply should always be turned on/off by following item 6.3
" Power on/off sequence ".

(c) Module has high frequency circuits. Sufficient suppression to the electromagnetic interference shall be done by system manufacturers. Grounding and shielding methods may be important to minimize the interference.

(d) The standard limited warranty is only applicable when the module is used for general notebook applications. If used for purposes other than as specified, SEC is not to be held reliable for the defective operations. It is strongly recommended to contact SEC to find out fitness for a particular purpose.

(e) The standard limited warranty is only applicable when the module is used for general notebook applications. If used for purposes other than as specified, SEC is not to be held reliable for the defective operations. It is strongly recommended to contact SEC to find out fitness for a particular purpose.

4. OTHERS

(a) Ultra-violet ray filter is necessary for outdoor operation.

(b) Avoid condensation of water. It may result in improper operation or disconnection of electrode.

(c) Do not exceed the absolute maximum rating value. (the supply voltage variation, input voltage variation, variation in part contents and environmental temperature, so on) Otherwise the module may be damaged.

(d) If the module displays the same pattern continuously for a long period of time, It can be the situation when the image "sticks" to the screen.

(e) This module has its circuitry PCB's on the rear side and should be handled carefully in order not to be stressed

Samsung Secret

Doc.No.	LTN156AT27-H02	Rev.No	04-PI-G-120329	Page	24 / 24